

# Mapping the core journals of the physical therapy literature\*

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**Objectives:** The purpose of this study was to identify (1) core journals in the literature of physical therapy, (2) currency of references cited in that literature, and (3) online databases providing the highest coverage rate of core journals.

**Method:** Data for each cited reference in each article of four source journals for three years were recorded, including type of literature, year of publication, and journal title. The journal titles were ranked in descending order according to the frequency of citations and divided into three zones using Bradford's Law of Scattering. Four databases were analyzed for coverage rates of articles published in the Zone 1 and Zone 2 journals in 2007.

**Results:** Journal articles were the most frequently cited type of literature, with sixteen journals supplying one-third of the cited journal references. *Physical Therapy* was the most commonly cited title. There were more cited articles published from 2000 to 2007 than in any previous full decade. Of the databases analyzed, CINAHL provided the highest coverage rate for Zone 1 2007 publications.

**Conclusions:** Results were similar to a previous study, except for changes in the order of Zone 1 journals. Results can help physical therapists and librarians determine important journals in this discipline.

## INTRODUCTION

According to the American Physical Therapy Association (APTA), physical therapy (referred to as physiotherapy in many other countries) is "a dynamic profession with an established theoretical and scientific base and widespread clinical applications in the restoration, maintenance, and promotion of optimal physical function" [1]. One of APTA's "Goals That Represent the Priorities of the American Physical Therapy Association" states that "Research advances the science of physical therapy and furthers the evidence-based practice of the physical therapist" [2].

The physical therapy profession is constantly growing, with employment expected to grow by 30% from 2008 to 2018, faster than the average for health care professions [3]. Physical therapy practice is evolving in response to new research [4], an aging population, and a more health-conscious society. A search of MEDLINE on the subject "Physical Therapy" for a 10-year period (2000–2009) indicates a growing knowledgebase, with the number of articles indexed each year more than doubling. However, this growth has often occurred without translation into clinical practice [5–9]. Knowing which journals and databases are the most efficient and most utilized sources of information relevant to patient management and care can help physical therapists incorporate more evidence into their practice. It is also important to document the currency of the cited articles as a part of practicing evidence-based rehabilitation that is most up to date. Knowledge of core journals in a discipline is also helpful to librarians so

## Highlights

- More cited references were published in the last eight years studied than in any previous full decade.
- *Physical Therapy*, *Archives of Physical Medicine and Rehabilitation (APMR)*, and *Spine* were the most frequently cited titles. Previous studies found *APMR* to be the most cited journal.
- CINAHL provided the highest coverage rate for the most commonly cited titles, with MEDLINE and EMBASE providing the best coverage for the next group of titles.

## Implications

- Health sciences librarians and clinicians can use these results to identify important journals for developing collections and determining the need for access to back issues of journals.
- Multiple databases are needed for comprehensive coverage of the physical therapy discipline

that a collection can be developed that will meet the needs of the users.

## LITERATURE REVIEW

Wakiji performed a bibliometric analysis of the core literature of physical therapy in 1997 as part of a larger project to map the literature of allied health [10]. Wakiji analyzed 22,945 citations from the reference lists of all articles in the journals, *Physical Therapy* and *Archives of Physical Medicine and Rehabilitation (APMR)*, between the years 1991 and 1993. MEDLINE was determined to provide the best access

\* Based on a presentation at MLA '09, the 109th Annual Meeting of the Medical Library Association; Honolulu, HI; May 2009.



Supplemental Table 5 and Table 7 are available with the online version of this journal.

to these cited articles, when compared to the Allied and Complementary Medicine Database (AMED) (referred to as Allied Alternative Medicine Database in the Wakiji study), CINAHL, and EMBASE.

Bohannon performed a similar citation analysis for seven physical therapy journals published between 1997 and 1998—*Physical Therapy*, *Physiotherapy*, *Physiotherapy Canada*, *Australian Journal of Physiotherapy*, *Physiotherapy Theory and Practice*, *Physiotherapy Research International*, and *Journal of Physical Therapy Practice*—and found forty-seven core titles [11]. The database EMBASE was determined to provide more comprehensive coverage of core journals than either MEDLINE or CINAHL.

Maher et al. conducted a study in 2001 to identify core journals of evidence-based physical therapy by analyzing contributions to the Physiotherapy Evidence Database (PEDro) [12]. Forty-nine journals out of the 519 analyzed were designated as core journals.

The science of physical therapy has expanded tremendously, as evidenced by an increased number of evidence-based clinical practice guidelines for physical therapy, randomized controlled trials and systematic reviews related to physical therapy in PEDro [13], increasing complexity of practice and clinical decisions [4], and growth in physical therapy journal publications. Because several years have passed since the most recent analysis of the core journals of physical therapy was published, a reanalysis of the core physical therapy literature was needed to aid physical therapy professionals in performing literature searches that are optimally efficient and facilitate evidence-based practice. With tighter budgets and increased costs of resources, librarians are faced with the task of optimizing the collection for a discipline. An update of the previous studies can help in this collection development task.

## METHOD

The study involved four main steps: (1) select key analysis journals for bibliometric study; (2) analyze each citation from all articles in the key journals over a three-year period (journal title, type of literature, and date of publication) and enter data into a database for analysis; (3) calculate descriptive statistics, including frequency of each type of literature (e.g., journals, books, etc.) for comparisons and frequency of each specific cited journal title for ranking of the core journals; and (4) compare database coverage for articles published in the most frequently cited journals.

### 1. Select analysis journals

To select the journals to undergo bibliometric analysis, several sources were reviewed. Physical therapy faculty members were consulted, as were the ranked lists of cited journals from the Wakiji [10], Bohannon [11], and Maher [12] studies and physical therapy journals with high impact factors, as identified by the science edition of *Journal Citation Reports* [14]. After considering these sources, four journals with broad,

global approaches that concentrated on physical therapy clinical practice were targeted for analysis: *Physical Therapy* (the APTA journal), *Physiotherapy* (journal of the Chartered Society of Physiotherapy, England), *Physiotherapy Canada* (journal of the Canadian Physiotherapy Association), and *Australian Journal of Physiotherapy* (journal of the Australian Physiotherapy Association). Miller et al. selected these same four journals for an analysis of rigor of published articles in physical therapy journals [15].

### 2. Analyze and categorize each citation

For citation analysis, the study employed the same methodological foundation as the Wakiji [10] article, which is the model used by similar articles devoted to mapping the literature of various fields of allied health [16]. Each of these bibliometric studies used Bradford's Law of Scattering, which states that "a relatively small core of journals can be expected to account for a disproportionate amount of the literature" for any specialty [17]. The underlying assumption of Bradford's law is that, for any given topic, a small core of journals publishes most of the articles on that topic [18].

The title of the cited journal, the type of literature (journal articles, books, or miscellaneous, such as letters to the editor, conference papers, etc.), and year of publication were recorded for each cited reference in each article published between the years 2005 and 2007 in the four journals. Inclusion criteria (what would be recorded as a book, journal, or miscellaneous) for cited references were determined by the researchers prior to the study. Cited references for *Physical Therapy*, *Physiotherapy*, and *Australian Journal of Physiotherapy* were downloaded electronically through Scopus. Cited references for *Physiotherapy Canada*, which was not indexed in Scopus, were manually categorized by a member of the research team using electronic copies of the articles and were manually loaded into the database. Any cited journal with multiple titles was recorded under the most current 2007 title. All data from all sources were combined into a single database for descriptive analysis.

### 3. Perform descriptive or frequency analysis

The total number of citations for each journal in the entire data set and the total number of citations for each year of citation publication were determined. The cited journals were then ranked in descending order according to the number of times they were referenced in the data set. Finally, the ranked list of journals was divided into three zones according to the frequency of citation, with each zone containing approximately one-third of the total journal citations and categorized according to Bradford's law as either Zone 1, a small group of core journals in physical therapy with the highest productivity (approximately one-third of the total citations); Zone 2, a larger set including the next most productive journals (approx-

**Table 1**  
Database coverage scale

Rating percentage coverage of articles	
5	(95%–100%)
4	(75%–94%)
3	(50%–74%)
2	(25%–49%)
1	(1%–24%)
0	(<1%)

imately one-third of the total citations); and Zone 3, the largest group of journals including many journals that were not cited frequently [16].

#### 4. Compare database coverage

Coverage of the AMED, MEDLINE, CINAHL, and Scopus databases was then analyzed and rated using the 0–5 scale shown in Table 1, based on coverage of articles published by the Zone 1 journals in the year 2007. Zone 2 was analyzed in the same manner. The scale was developed by Schloman to rate database coverage to allow comparison of multiple allied health journals regardless of the number of articles published each year [16].

### RESULTS

The 4 selected journals contained a total of 857 articles published between 2005 and 2007, and 20,027 citations from all the reference lists were included in the analysis for this study. The most frequently cited type of literature was journal article, making up 83% of total citations. The books and miscellaneous categories accounted for approximately 8% each, with specific results displayed in Table 2. Books included books and book chapters. Miscellaneous included non-journal, nonbook resources, including web pages.

Table 3 shows that when the date of publication of citations was analyzed, the most recent 8 years (2000–2007), even though not a complete decade, contained more cited references (45.5% of total citations from the study) than any previous full decade, with another 39.5% coming from the prior decade of 1990–1999.

As shown in Table 4, Zone 1 journals, accounting for one-third of the 16,518 cited journal references, consisted of only 16 highly cited journals, or 0.98% of the total cited journals. Zone 2 consisted of 96 journals

(5.86% of the total journals), and Zone 3 consisted of 1,527 journals (93.17% of the total journals). The top three Zone 1 journals, in order, were *Physical Therapy*, *APMR*, and *Spine*. Table 5 (online only) contains a complete list of Zone 1 and Zone 2 journal titles as determined in the current study.

Of the databases analyzed, CINAHL provided the highest coverage rate (total database average coverage score=4) for Zone 1 journals published in 2007. To determine the database coverage score, the number of articles published in each journal for 2007 was compared to the number of those articles indexed in the database. The scale noted in Table 1 was used.

For the sixteen journals in Zone 1, the coverage rate score for each of the four databases is illustrated in Table 6. For the Zone 2 journals (ninety-six titles), Scopus provided the best coverage as illustrated in Table 7 (online only). MEDLINE also provided strong coverage. Databases varied in their indexing depth.

Results of this study (Table 8) were similar to those found by Wakiji [10]. The majority of citations from both studies were journal articles published within the most recent decade. Approximately 50% of the Zone 1 journals were included in Zone 1 of both studies, despite the fact that different target journals were selected to study the cited references. Wakiji's highest ranked titles—*APMR*, *Physical Therapy*, and *Journal of Bone and Joint Surgery*—ranked number 2, 1, and 10, respectively, in this study. A major difference in the 2 studies was that MEDLINE provided the most effective indexing coverage of the physical therapy literature in the Wakiji study [10], while CINAHL had the best coverage in this present study.

Bohannon [11] divided his data into 2 groups, each with approximately one-half of the citations. Ten of those core titles accounted for 54.6% of the citations, with *Physical Therapy*, *Physiotherapy*, and *APMR* as the 3 most-cited titles. These titles ranked number 1, 6, and 2, respectively, in this current study. Bohannon found EMBASE to have the strongest indexing coverage, with MEDLINE and CINAHL also strong. He noted that using both MEDLINE and CINAHL would provide indexing coverage for 95.7% of the core journals.

Maher's study [12] resulted in a list of the top 49 journals, based on a citation analysis of the PEDro database, which includes clinical trials and systematic reviews. The top 3 journals in his study were *APMR*

**Table 2**  
Cited format types by source journal and total frequency

Cited format type	Source journal citations							
	<i>Physical Therapy</i>		<i>Physiotherapy</i>		<i>Physiotherapy Canada</i>		<i>Australian Journal of Physiotherapy</i>	
	No.	%	No.	%	No.	%	No.	%
Journal articles	10,088	85.9%	2,190	74.1%	2,115	80.0%	2,233	83.3%
Books	909	7.7%	330	11.2%	337	12.7%	195	7.3%
Miscellaneous	752	6.4%	435	14.7%	192	7.3%	251	9.4%
Total citations	11,749	100.0%	2,955	100.0%	2,644	100.0%	2,679	100.0%
Total source articles, 2005–2007	452		123		107		175	
							857	

**Table 3**

Cited format types, as total number and percentage of the type, by publication period

Publication year	Books (n=1,771)	Journal articles (n=16,626)	Miscellaneous (n=1,630)	Total citations (n=20,027)
2000–2007	32.18%	44.81%	69.74%	45.54%
1990–1999	46.25%	40.49%	21.04%	39.54%
1980–1989	14.57%	10.74%	6.44%	10.75%
1970–1979	4.57%	2.58%	1.99%	2.71%
1960–1969	1.13%	0.82%	0.20%	0.80%
Pre-1960	1.13%	0.53%	0.46%	0.58%
Not available	0.17%	0.03%	0.53%	0.09%

and *British Medical Journal/BMJ* tied with *Spine*. These titles ranked number 2, 8, and 3, respectively, in the current study.

### LIMITATIONS OF THE STUDY

Even though category criteria were discussed and determined in advance, citations were subjectively assigned to categories by the researchers, allowing potential error. The results might have been biased because of the source journals selected for analysis and/or the tendency for articles in a given journal to cite other articles from the same journal. Also, journals that publish more articles per year might be more likely to have articles cited in published works. The study methodology was also biased against journals published in languages other than English, because all source journals analyzed were in English. Because two of the four source journals were based in North America (*Physical Therapy* and *Physiotherapy Canada*), there could be a bias toward American-published literature.

Interpretation of the research results should consider the perspective of journals published by professional associations. Some associations might have a greater focus on a particular area of practice than others. Journals that focus on a specialized practice setting or patient population will probably be cited less frequently in the total collection of physical therapy citations than those with a broader scope.

### DISCUSSION

It is interesting that while both Wakiji [10] and Maher [12] both found *APMR* to be the most frequent journal source of cited articles, the current study, a decade later, determined *APMR* as second most common, with *Physical Therapy* being most common. This could reflect the increasing number of publications that are specifically physical therapy-related in physical ther-

apy journals. It is notable that *APMR* is still the second most frequently cited journal among the four target journals, even though it was not used as one of the source journals analyzed in this study.

Differences in the findings could be related to the journals utilized for the analysis. Future bibliometric research could focus more specifically on the indexing coverage and factors that increase coverage. The therapist clinician or researcher should consider that a database that is less inclusive might still be valuable in that it may provide a stronger search system, with matching to Medical Subject Headings (MeSH), which improves the efficiency and specificity of the search.

The category of "books," which includes chapters in books, had a total number of citations significantly less than that found for journal articles. Wakiji [10] also found fewer book citations than journals articles. Bohannon [11] and Maher [12] did not analyze book citations for their study. This is a promising development, suggesting that researches are citing the journal literature, which is usually considered to be more evidence based than books, book chapters, or the Internet.

In an update of the occupational therapy citation mapping study, Potter [19] found that the discipline's association journal, *American Journal of Occupational Therapy*, remained the strongest in the field. Similarly, the current study found the physical therapy association journal, *Physical Therapy*, to be the strongest in the field. However, Potter found that newer journals have begun to encroach on that journal's supremacy. The top journals in the present study remained constant, although with a slight rearrangement in ranking. Potter also found that coverage of occupational therapy journals by major health sciences databases had improved. CINAHL has improved coverage of the core journals of physical therapy, especially for those in Zone 1. However, when looking at the coverage for Zones 1 and 2 in the current study, Scopus provided the strongest cover-

**Table 4**

Distribution by zone of cited journals and references

Zone	Cited journals		Cited journal references		
	No.	%	No.	%	Cumulative total
Zone 1	16	0.98%	5,531	33.48%	5,531
Zone 2	96	5.86%	5,514	33.38%	11,045
Zone 3	1,527	93.17%	5,473	33.13%	16,518
Total	1,639	100.00%	16,518	99.99%	



**Table 6**

Zone 1 titles, number of cited references, indexing coverage

Cited journals	Total citations	Coverage*			
		Allied and Complementary Medicine Database (AMED)	CINAHL	MEDLINE	Scopus
Zone 1					
1. Phys Ther	1,106	3	4	3	4
2. Arch Phys Med Rehabil	798	2	2	2	2
3. Spine	739	1	4	4	5
4. J Am Geriatr Soc	299	1	5	5	5
5. J Orthop Sports Phys Ther	275	3	5	4	5
6. Physiotherapy	253	3	3	0	3
7. Stroke	247	0	4	5	4
8. BMJ	238	0	5	4	2
9. Med Sci Sports Exerc	234	1	4	0	4
10. J Bone Joint Surg Am	206	0	4	0	5
11. Aust J Physiother	202	5	5	5	1
12. Clin Rehab	193	3	5	3	1
13. Pain	190	1	0	5	4
14. Physiother Can	190	4	5	0	0
15. Clin Orthop Relat Res	185	1	4	5	0
16. JAMA	176	1	5	5	2
Zone 1 total		29	64	50	47
Zone 1 average		1.81	4	3.13	2.94

\* Indexing coverage scale: 5 (95%–100%); 4 (75%–94%); 3 (50%–74%); 2 (25%–49%); 1 (1%–24%); 0 (&lt;1%).

age, with MEDLINE also providing strong coverage. For comprehensive coverage of the physical therapy literature, use of multiple databases provides the best results.

Burtis and Taylor [20], in an update of the mapping of the health education literature, found that percentages of journals in the core (Zones 1 and 2) remained stable. The present study, likewise, was comparable with the percentage in each zone in the Wakiji study [10]. The core dispersion for the occupational therapy, health education, and physical therapy disciplines is similar.

## CONCLUSION

As noted by Potter [20], updates of previous bibliometric studies give a “fresh snapshot, a redrawn map” for a discipline’s literature. In journal publications in the field of physical therapy, journals were

cited (83% of citations) more frequently than books or other types of documents. The physical therapy literature does rely heavily on recent publications, with almost half of the citations published in the most recent 8-year period. The study revealed that CINAHL provided the best indexing of the core physical therapy literature, with MEDLINE and Scopus also providing strong coverage, indicating the need to access multiple databases.

Knowing which journals are considered core journals for a particular discipline and which databases provide the most comprehensive indexing of those journals can help the health sciences librarian develop a core collection in the discipline. It can also help the clinician to search for and obtain articles to promote evidence-based practice and to decide which journals to target for publication. Areas for future study include examining the core physical therapy

**Table 8**

Core journals in physical therapy: rank comparison with previous studies

Rankings from current study 2005–2007 (total # of citations)	Rankings from Wakiji [14] 1991–1993 (# of citations)	Rankings from Bohannon [19] 1997–1998 (# of citations)	Rankings from Maher [20] 2001 PEDro (# of citations)
1. Phys Ther (1,106)	2 (1,205)	1 (553)	4 (73)
2. Arch Phys Med Rehabil (798)	1 (1,654)	3 (189)	1 (109)
3. Spine (739)	4 (323)	4 (176)	2.5 (82)
4. J Am Geriatr Soc (299)	33 (87)	14 (64)	18 (24)
5. J Orthop Sports Phys Ther (275)	24 (125)	9 (87)	10.5 (32)
6. Physiotherapy (253)	34 (87)	2 (244)	7.5 (49)
7. Stroke (247)	25 (121)	27.5 (36)	15.5 (26)
8. BMJ (238)	27 (103)	12 (71)	2.5 (82)
9. Med Sci Sports Exerc (234)	17 (159)	20 (53)	31.5 (15)
10. J Bone Joint Surg Am (206)	3 (372)	6 (98)*	44.5 (10)
11. Aust J Physiother (202)	85 (34)	8 (91)	31.5 (15)
12. Clin Rehabil (193)	Zone 3	34 (29)	10.5 (32)
13. Pain (190)	16 (166)	11 (74)	6 (51)
14. Physiother Can (190)	38 (81)	7 (96)	19.5 (23)
15. Clin Orthop Rel Res (185)	5 (323)	10 (86)	29.5 (16)
16. JAMA (176)	8 (249)	19 (54)	15.5 (26)

\* As American and British volumes were not always differentiated among citations, they are combined.

literature using physical therapy specialty journals or broader physical therapy-related journals, with comparison between core journal lists determined by using each of the core journals from this article individually. Replicating the Wakiji [10] study and the Bohannon [11] study, using the same source journals, would help determine if a shift in the core titles had occurred or if the difference in the source journals selected had influenced the differences in this study.

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